AD-A128 054 COLORLESS OPTICAL GLASS(U) FOREIGN TECHNOLOGY DIV 1/1
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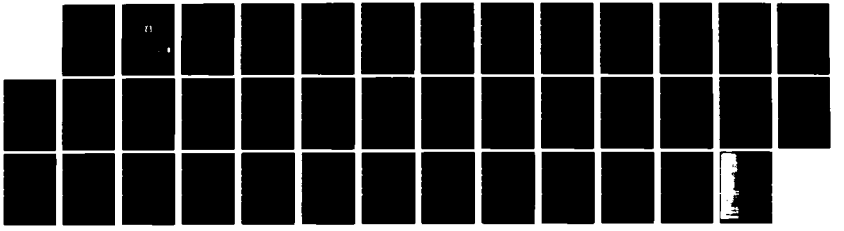

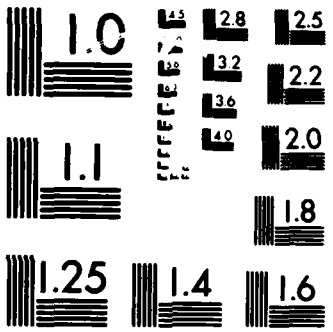

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

(2)

FTD-ID(RS)T-0230-83

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FOREIGN TECHNOLOGY DIVISION

COLORLESS OPTICAL GLASS

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EDITED TRANSLATION

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COLORLESS OPTICAL GLASS

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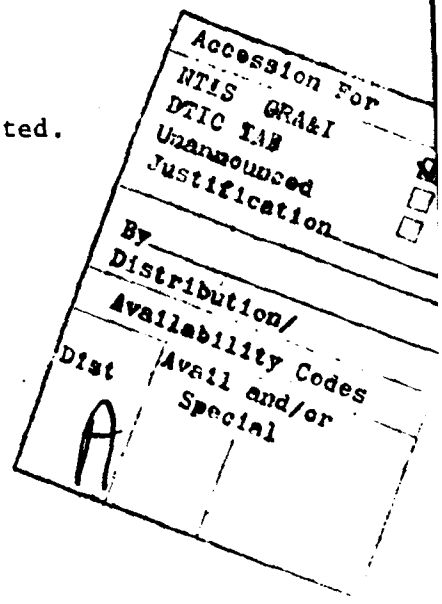

PREPARED BY:

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WP-AFB, OHIO.

U. S. BOARD ON GEOGRAPHIC NAMES TRANSLITERATION SYSTEM

Block	Italic	Transliteration	Block	Italic	Transliteration
А а	*А а*	A, a	Р р	*Р р*	R, r
Б б	*Б б*	B, b	С с	*С с*	S, s
В в	*В в*	V, v	Т т	*Т т*	T, t
Г г	*Г г*	G, g	У у	*У у*	U, u
Д д	*Д д*	D, d	Ф ф	*Ф ф*	F, f
Е е	*Е е*	Ye, ye; E, e*	Х х	*Х х*	Kh, kh
Ж ж	*Ж ж*	Zh, zh	Ц ц	*Ц ц*	Ts, ts
З з	*З з*	Z, z	Ч ч	*Ч ч*	Ch, ch
И и	*И и*	I, i	Ш ш	*Ш ш*	Sh, sh
Й й	*Й й*	Y, y	Щ щ	*Щ щ*	Shch, shch
К к	*К к*	K, k	Ъ ъ	*Ъ ъ*	"
Л л	*Л л*	L, l	Ы ы	*Ы ы*	Y, y
М м	*М м*	M, m	Ь ь	*Ь ь*	'
Н н	*Н н*	N, n	Э э	*Э э*	E, e
О о	*О о*	O, o	Ю ю	*Ю ю*	Yu, yu
П п	*П п*	P, p	Я я	*Я я*	Ya, ya

*ye initially, after vowels, and after ъ, ь; e elsewhere.
When written as ё in Russian, transliterate as yё or ё.

RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	$\sinh^{-1}$
cos	cos	ch	cosh	arc ch	$\cosh^{-1}$
tg	tan	th	tanh	arc th	$\tanh^{-1}$
ctg	cot	cth	coth	arc cth	$\coth^{-1}$
sec	sec	sch	sech	arc sch	sech^{-1}
cosec	csc	csch	csch	arc csch	csch^{-1}

Russian	English
rot	curl
lg	log

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GOST 3514-67*

USSR State Standard

Committee of Standards, Measures, and Measuring Devices under the Council of Ministers, USSR

COLORLESS OPTICAL GLASS

Replaces GOST 3514-57

Group P40

* Reprint (May 1969) with change No 1, accepted in March 1969.

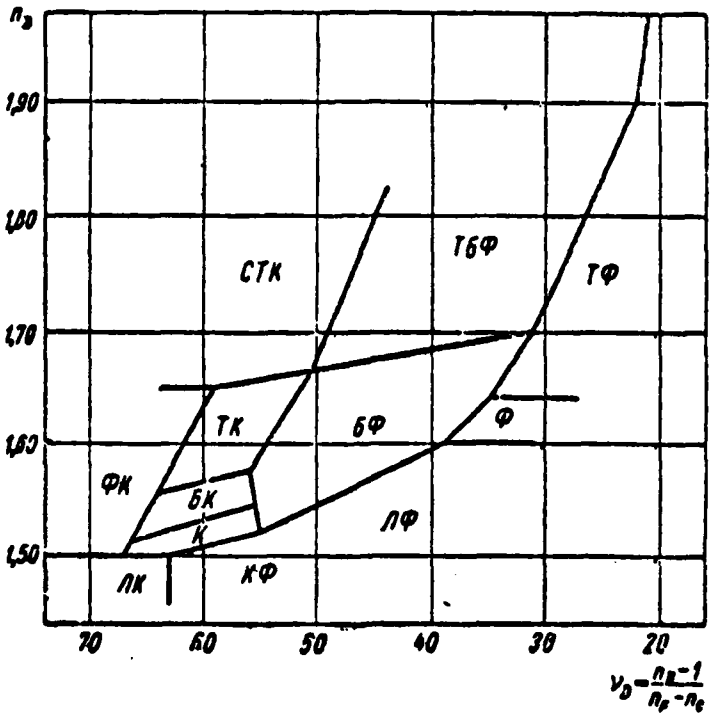
Approved by the Committee of Standards, Measures and Measuring Devices of the Council of Ministers, USSR on 19 September 1967.

Period of implementation 1 July 1968.

The present standard extends to optical colorless inorganic glass in blanks with a diameter (or with greatest side) of no more than 500 mm.

1. Types and Brands. Main Parameters. Categories and Classes

1.1. The following types of optical colorless glasses have been established, depending on their position on the coordinate field of the diagram "Refractive index n_D - dispersion value ν_D" (see drawing and Table 1). An exception are the special flints (OF) [flint glasses], which can be found on any of the sectors of the field of the diagram.



1.2. Optical colorless glass should be made:

of series 0 (with numeration of brands from 1 to 100) - ordinary glass;

of series 100 (with numeration of brands from 101 to 199) - glasses which darken little under the influence of ionization radiation.

1.3. Optical colorless glass should be made of the following brands with the refractive index n_D and average dispersion $n_F—n_C$ indicated in Table 2.

Table 1

Type designation		Name	Type designation		Name
LK	ЛК	Light crown glasses	BF	БФ	Barite flint glasses
FK	ФК	Phosphate crown glasses	TBF	ТБФ	Heavy barite flint glasses
K	К	Crown glasses	LF	ЛФ	Light flint glasses
BK	БК	Barite crown glasses	F	Ф	Flint glasses
TK	ТК	Heavy crown glasses	TF	ТФ	Heavy flint glasses
STK	СТК	Ultraheavy crown glasses	OF	ОФ	Special flint glasses
KF	КФ	Crown-flints			

Table 2

Key:

1 - Brand of glass;

2 - Refractive index n_D;

3 - Average dispersion $n_F - n_C$.

Марка стекла (1)	Показатель преломления n_D (2)	Средняя дисперсия $n_F - n_C$ (3)	Марка стекла (1)	Показатель преломления (2) n_D	Средняя дисперсия $n_F - n_C$ (3)
Light crown glasses			Crown glasses		
ЛК1	1,4398	0,00639	(К1)	1,4982	0,00765
ЛК3	1,4374	0,00696	К2, (К102)	1,5004	0,00758
ЛК4	1,4903	0,00753	(К3)	1,5100	0,00805
ЛК5, ЛК105	1,4781	0,00729	(К5)	1,5110	0,00795
ЛК6	1,4704	0,00704	К8, К108	1,5163	0,00806
ЛК7	1,4628	0,00728	К14, К114	1,5147	0,00849
			К15	1,5335	0,00962
Phosphate crown glasses			К17	1,5163	0,00806
			(К18)	1,5191	0,00860
ФК1	1,5190	0,00743	К19, К119	1,5187	0,00841
ФК13	1,5468	0,00809	К20	1,5263	0,00875
ФК14	1,5799	0,00891			

Continued.

1 - Brand of glass;

2 - Refractive index n_D;

3 - Average dispersion $n_F - n_C$.

Марка стекла (1)	Показатель преломления n_D (2)	Средняя дисперсия $n_F - n_C$ (3)
Barite crown glasses		
БК4, БК104	1,5302	0,00877
БК6, БК106	1,5309	0,00905
БК8, БК108	1,5467	0,00871
(БК9)	1,5646	0,01012
БК10, БК110	1,5688	0,01015
(БК11)	1,5524	0,00872
БК12	1,5606	0,00961
БК13	1,5594	0,00915
Heavy crown glasses		
(ТК1), (ТК101)	1,5638	0,00928
ТК2, ТК102	1,5724	0,00996
ТК4, ТК104	1,6111	0,01095
ТК8, ТК103	1,6140	0,01114
(ТК9), (ТК109)	1,6171	0,01142
ТК12, ТК112	1,5688	0,00901
ТК13	1,6038	0,00996
ТК14, ТК114	1,6130	0,01012
ТК16, ТК116	1,6126	0,01050
ТК17	1,6279	0,01058
ТК20, ТК120	1,6220	0,01097
ТК21, ТК121	1,6568	0,01265
ТК23	1,5891	0,00962
ТК123	1,5887	0,00967
Ultraheavy crown glasses		
СТК3	1,6591	0,01150
СТК7	1,6869	0,01282
СТК8	1,7030	0,01415
СТК9	1,7424	0,01478
(СТК10)	1,7378	0,01534
(СТК12)	1,6919	0,01258
Crown-flints		
(КФ1)	1,5153	0,00946
КФ4, КФ104	1,5181	0,00879
(КФ5)	1,4996	0,00805
КФ6, КФ106	1,5005	0,00875
КФ7	1,5175	0,01012
(КФ8)	1,5332	0,01126

Марка стекла (1)	Показатель преломления (2) n_D	Средняя дисперсия (3) $n_F - n_C$
Barite flint glasses		
БФ1	1,5247	0,00955
БФ4	1,5480	0,01016
БФ6, БФ106	1,5696	0,01152
БФ7, БФ107	1,5795	0,01076
БФ8, БФ108	1,5826	0,01254
БФ11, БФ111	1,6222	0,01171
БФ12, БФ112	1,6259	0,01601
БФ13, БФ113	1,6395	0,01325
БФ16	1,6709	0,01419
БФ18	1,5604	0,01100
БФ19	1,5895	0,01153
БФ21	1,6140	0,01534
(БФ23)	1,5493	0,01048
БФ24	1,6344	0,01726
БФ25	1,6076	0,01318
(БФ26)	1,6504	0,01691
БФ27	1,6067	0,01380
БФ28	1,6641	0,01874
Heavy barite flint glasses		
ТБФ3	1,7557	0,01837
ТБФ4	1,7786	0,02045
Light flint glasses		
(ЛФ1)	1,5406	0,01145
ЛФ5, ЛФ105	1,5749	0,01392
(ЛФ7)	1,5783	0,01407
ЛФ8	1,5574	0,01327
ЛФ9	1,5900	0,01526
ЛФ10	1,5480	0,01195
ЛФ11, ЛФ111	1,5603	0,01199
ЛФ12	1,5401	0,01204
Flint glasses		
Ф1	1,6128	0,01659
Ф101	1,6138	0,01659
(Ф2)	1,6164	0,01684
(Ф102)	1,6169	0,01684
Ф4	1,6242	0,01738
Ф104	1,6247	0,01738

1 - Brand of glass;

2 - Refractive index n_D;

3 - Average dispersion $n_F - n_C$.

Марка стекла (1)	Показатель преломления n_D (2)	Средняя дисперсия $n_F - n_C$ (3)	Марка стекла (1)	Показатель преломления n_D (2)	Средняя дисперсия $n_F - n_C$ (3)
Ф6	**1,6031**	**0,01590**	**ТФ7**	**1,7280**	**0,02570**
(Ф7)	1,6232	0,01689	ТФ8, ТФ108	1,6993	0,02215
Ф8	1,6248	0,01757	ТФ10	1,8060	0,03178
Ф108	1,6253	0,01757	ТФ11	1,6486	0,02054
Ф9	1,6137	0,01775	ТФ12	1,7849	0,03059
Ф13	1,6199	0,01706			
Ф113	1,6201	0,01706	Special flint glasses		
Heavy flint glasses			ОФ1, ОФ101	1,5294	0,01022
			(ОФ2)	1,5538	0,01140
ТФ1, ТФ101	1,6475	0,01912	ОФ3	1,6123	0,01389
ТФ2, ТФ102	1,6725	0,02087	ОФ4	1,6505	0,01497
ТФ3	1,7172	0,02431	ОФ5	1,6625	0,01586
ТФ4	1,7398	0,02628			
ТФ5, ТФ105	1,7550	0,02743			

Note:

1. Glasses of brands set out in bold type should be used preferably.

2. Glasses of brands inclosed in parentheses are not permitted to be used in new developments.

3. The chemical (synthetic) composition of optical glasses is defined by the technical documentation which has been approved in the established order.

(CHANGED WORDING - "Information directory of standards" No 3, 1969).

1.4. Optical colorless glass is divided into categories and classes based on the following quality indices:

a) permissible deviation of the refractive index n_D and average dispersion $n_F - n_C$ from the values established for glass of each brand;

b) uniformity of a batch of glass blanks in respect to refractive index and average dispersion;

c) optical uniformity;

d) double refraction;

e) coefficient of light absorption;

f) stria-free;

g) bubble character.

Recommendations for the selection of categories of optical uniformity, double refraction and stria-free state are given in Table 1 of the appendix to the present standard.

1.5. Based on the permissible deviations of the refractive index and average dispersion from the values established for glass of each brand, the five categories indicated in Table 3 are established.

Table 3

(1) Категория	(2) Допускаемые отклонения	
	(3) показателя преломления n_D	средней дисперсии $n_F - n_C$ (4)
0	$\pm 3 \cdot 10^{-4}$	$\pm 3.10^{-5}$
1	$\pm 5 \cdot 10^{-4}$	$\pm 5.10^{-5}$
2	$\pm 7 \cdot 10^{-4}$	$\pm 7.10^{-5}$
3	$\pm 10 \cdot 10^{-4}$	$\pm 10.10^{-5}$
4	$\pm 20 \cdot 10^{-4}$	$\pm 20.10^{-5}$

Key: (1) Category; (2) Permissible deviations; (3) Refractive index n_D; (4) Average dispersion $n_F - n_C$.

1.6. Depending on the uniformity of a batch of glass blanks in respect to refractive index and average dispersion three classes are established (indicated in Table 4).

Table 4

Класс (1)	(2) Наибольшая разность в партии заготовок	
	(3) показателя преломления Δn_D	(4) средней дисперсии $\Delta(n_F - n_C)$
А (A)	$0{,}5 \cdot 10^{-4}$	$1 \cdot 10^{-5}$
Б (B)	$1 \cdot 10^{-4}$	$1 \cdot 10^{-5}$
В (V)	(5) В пределах допускаемых отклонений по указанной при заказе категории согласно табл. 3	

Key: (1) Class; (2) Greatest difference in batch of blanks; (3) Refractive index Δn_D; (4) Average dispersion $\Delta(n_F - n_C)$; (5) Within the limits of permissible deviations in respect to the category indicated in the order according to Table 3.

The refractive index and average dispersion of all blanks of a batch of glass should correspond to the category indicated in the order for Table 3.

1.7. Based on optical uniformity two systems are established for evaluating blanks of glass depending on their measurements.

1.7.1. For blanks with a diameter (or with sides) no more than 150 mm five categories of optical uniformity are established (Table 5). They are characterized by the numerical value of the ratio of the angle of resolution φ of the collimator installation, into the parallel pencil of rays of which the blank of glass is introduced, to the theoretical angle of resolution φ_0 of the same installation. The theoretical angle of resolution φ_0 is taken as equal to 120"/D, where D - diameter of the diaphragm of the collimator in millimeters, equal to the diameter of the round blank or the smallest side of a rectangular blank.

Evaluation of the optical uniformity using the system, determined by the φ/φ_0 ratio, is also permitted for blanks of greater dimensions, if they are intended for parts, not working simultaneously with the entire surface, but with individual sections of it, with a diameter up tc 150 mm inclusive.

Table 5

(1) Категория	(2) Отношение φ/φ_0 не более
1 и 2	1,0
3	1,1
4	1,2
5	1,5

Key: (1) Category; (2) Ratio φ / φ_0, no more than.

Glass of the 1st category of optical uniformity according to Table 5 additionally should meet the following requirements: during scanning of a blank of glass on a collimator installation with a point target, the diffraction image of the luminous point should consist of a light round spot, surrounded by rings which are concentric with it; the diffraction picture should not have discontinuities, tails and angles, and should not display a deviation from round which is noticeable to the eye.

1.7.2. For blanks with dimensions greater than 150 mm five categories of optical uniformity are established (Table 6). These are characterized by the greatest value of difference in the cource of the rays $\delta_{макс}$, measured in the working direction at the edge of the blank of glass, and by the uniformity of distribution of difference in course $\delta_{макс} - \delta_{мин}$ on the circumference or perimeter of the blank.

In blanks of categories 1K and 2K it is not permitted to have an edge difference of course corresponding to divergence stresses. For rectangular blanks with a ratio of sides greater than 1.2:1 the tolerances for $\delta_{макс} - \delta_{мин}$ based on categories 1K-4K and for $\frac{\delta_{макс} - \delta_{мин}}{\delta_{макс}}$ based on category 5K are established by orders on agreement between the customer and the producer.

1.8. In respect to double refraction six categories (Table 7) are established. They are characterized by the difference in the path of two beams, into which the incident beam is separated during passage in the glass.

Table 6

(1) Категория	(2) Краевое двойное лучепреломление в *нм*, не более, на всю толщину заготовки при оптическом коэффициенте напряжения стекла в *брюстерах**						(6) Примечание
	(3) До 2		Св. 2 до 2,8 (4)		(5) Св. 2,8		
	$\delta_{макс}$	$\delta_{макс}-\delta_{мин}$	$\delta_{макс}$	$\delta_{макс}-\delta_{мин}$	$\delta_{макс}$	$\delta_{макс}-\delta_{мин}$	
1к	40	20	60	30	80	40	(7) Заготовки, изготовляемые механической разделкой стекла, после обработки под заданный размер должны быть подвергнуты тонкому отжигу
2к	80	35	120	50	160	65	
3к	140	50	200	80	260	110	
4к	250	80	400	120	550	160	—
5к	$\delta_{макс}$ от 200 до 1000; $\frac{\delta_{макс}-\delta_{мин}}{\delta_{макс}}$ не более 30%						—

* Stress optical coefficients of the glasses and transition from categories of optical uniformity in Table 5 to categories in Table 6 are given in Tables 2 and 3 of the appendix of the present standard.

Key: (1) Category; (2) Edge double refraction in *nm*, *no more than*, for the entire thickness of the blank with the stress optical coefficients in Brewsters*; (3) Up to 2; (4) Above 2 up to 2.8; (5) Above 2.8; (6) Note; (7) Blanks, prepared by mechanical finishing of the glass, after treatment under the assigned measurements, should be subjected to fine annealing; (8) from.....to; (9) no more than. [subscripts for delta - max and min]

Table 7

(1) Категория	(2) Разность хода в *нм*, на 1 *см*, не более	(3) Дополнительное требование
1	2	—
1а	6	(4) В поляризованном свете заготовка в рабочем направлении не должна обнаруживать просветленных участков
2	6	—
3	10	—
4	20	—
5	50	—

Key: (1) Category; (2) Difference in path in nm per 1 cm, no more than; (3) Additional requirement; (4) In polarized light the blank in the working direction should not display illuminated sectors.

The difference in course is measured in the middle of the blank, in the direction of its greatest dimension (diameter or length), and is expressed in nm per 1 cm of path of the beam in the glass. With a ratio of sides of the blank greater than 2:1 it is permitted to measure the path in the direction of its width.

Glass of category 1a is evaluated qualitatively additionally in respect to double refraction in the direction of the thickness of the blank, i.e., in the working direction.

1.9. In respect to the coefficient of light absorption seven categories (Table 8) are established. They are characterized by the ratio of the flux of white light, absorbed by the glass on a path of 1 cm, to the light flux in the beginning of this path.

Table 8

(1) Категория	Коэффициент светопоглощения в %, (2) не более
000	0,2
00	0,4
0	0,6
1	0,8
2	1,0
3	1,5
4	3,0

Key: (1) Category; (2) Coefficient of light absorption in %, no greater than.

1.10. In respect to stria-free state two systems are established for evaluating blanks of glass depending on their dimensions.

1.10.1. For blanks with a diameter or with sides no greater than 300 mm and thickness no greater than 60 mm two categories of stria-free state are established (Table 9). They are characterized by the absence in a blank of glass of striae of the optical effect indicated in GOST 3521-57*.

Table 9

(1) Категория	(2) Характеристика бессвильности
1	(3) Не допускаются свили, равные по оптическому действию контрольной свили 1-й категории по ГОСТ 3521—57*
2	(4) Не допускаются свили, равные по оптическому действию контрольной свили 2-й категории по ГОСТ 3521—57*

Key: (1) Category; (2) Characteristics of stria-free state; (3) Striae not permitted which are equal in optical effect to the control stria of the 1st category in GOST 3521-57*; (4) Striae not permitted which are equal in optical effect to the control stria of the 2nd category in GOST 3521-57*.

* GOST 3521-69 has been in effect since 1 July 1970.

Nodal striae with a length up to 10 mm are permitted with a calculation of no more than 10 per 1 kg of glass.

1.10.2. For blanks with a diameter (or with sides) greater than 150 mm five categories of stria-free state are established (Table 10). They are characterized by the shadow picture of the striae contained in the glass, striae which are revealed under the conditions of control indicated in p. 3.10 of this standard.

Table 10

(1) Категория	(2) Теневая картина свилей на экране			(8) Диаметр светящейся точки при проектировании теневой картины на экран в *мм*
	(3) Потоки свилей	(5) Одиночные свили, не обнаруживающие двойного лучепреломления		
	(4) Общая площадь в % от площади заготовки, не более	(6) Общая длина, измеряемая диаметром или диагональю заготовки, не более	(7) Расстояние между одиночными свилями в *мм*, не менее	
1к	Не допускаются	1	50	0,2
2к	(9) Не допускаются	1	50	2,0
3к	10	2	30	2,0
4к	50	2	20	2,0
5к	(10) Не допускаются очень грубые одиночные свили и потоки свилей, около которых обнаруживается двойное лучепреломление с разностью хода более 30 *нм*, если свили после обработки заготовки будут находиться в центральной трети толщины готовой детали, и более 10 *нм*, если свили будут находиться в крайних третях толщины готовой детали.			—

Key: (1) Category; (2) Shadow picture of striae on screen; (3) Flows of striae; (4) Overall area in % of the area of the blank, not more than; (5) Single striae, not displaying double refraction; (6) Overall length, measured by the diameter or the diagonal of the blank, no more than; (7) Distance between individual striae in mm, no less than; (8) Diameter of luminescent point during projection of shadow picture on a screen in mm; (10) Not permitted to have very rough individual striae and flows of striae, near which double refraction is displayed with a path difference greater than 30 nm, if the striae after working of the blank are found in the central third of the thick-

(continued)

Table 10 (key, continued)
ness of the finished part, and greater than 10 nm if the striae are found in the extreme thirds of the thickness of the finished part; (9) Not permitted.

In the evaluation of stria condition according to categories 1K-4K the nodal striae and striae from stones are not taken into account and are not considered as individual, if their length does not exceed 35 mm. In the end zone of a blank with a width of 0.03 of its diameter or diagonal the striae are not standardized.

1.11. Depending on the number of directions in which a blank of glass should correspond to that category indicated in the order in respect to points 1.10.1 or 1.10.2 two classes of stria condition are established:

class B - two mutually perpendicular directions;

class V - one direction.

The directions, in which the blank should answer the required category, should be indicated in the order.

1.12. Based on bubble [bleb] condition eleven categories and six classes are established.

Stones, crystals and heads of nodal striae in the determination of category and class of bubble condition are equated to bubbles. Stones, accompanied by cracks, are not permitted.

1.12.1. Categories of bubble condition, characterized by the diameter of the largest bubble [bleb] in the head, are indicated in Table 11.

Table 11

(1) Категория	(2) Диаметр наибольшего пузыря в заготовке в мм	(1) Категория	(2) Диаметр наибольшего пузыря в заготовке в мм
1	(3) Не допускаются	5	0,5
1а	0,05	6	0,7
2	0,1	7	1
3	0,2	8	2
4	0,3	9	3
		10	5

Key: (1) Category; (2) Diameter of greatest bubble in blank in mm; (3) Not permitted.

Taken as the diameter of a bubble of elongated form is the dimension, obtained as the average arithmetic of the lengths of its greatest and least axis.

1.12.2. The classes of bubble condition, characterized by the average number of bubbles with a diameter greater than 0.03 mm in 1 kg of glass, are indicated in Table 12.

Table 12

(1) Класс	Среднее число пузырей диаметром свыше 0,03 мм в 1 кг стекла, не более (2)
А (A)	10
Б (B)	30
В (V)	100
Г (G)	300
Д (D)	1000
Е (E)	3000

Key: (1) Class; (2) Average number of bubbles with a diameter greater than 0.03 mm in 1 kg of glass, no more than.

In the glass of blanks of categories 1a-10 of bubble condition the number of bubbles with a diameter of 0.03 mm and less should not exceed the number of bubbles, permitted for the corresponding class.

For glass of blanks of the 1st category of bubble condition the class of bubble condition is not established.

2. Technical Requirements

2.1. In respect to permissible deviations of the refractive index and average dispersion, uniformity of a batch in respect to n_D and $n_F - n_C$, optical uniformity, double refraction, stria-free condition and bubble conditions, optical glass should conform to the categories and classes indicated in the order in accordance with points 1.5-1.12 of this standard.

2.2 Technical requirements for glass, not required in the order of the preliminary agreement with the producer, are established in Tables 13 and 14. Glass, corresponding to higher requirements than those indicated in the tables, and glass, for which the quality indices or parameters are standardized, indices which are not provided for by the present standard, are produced on a special agreement between the customer and the manufacturer.

The highest categories in respect to refractive index, average dispersion, optical uniformity, double refraction, light absorption and stria-free condition, classes of uniformity of a batch, stria-free condition and bubble condition, and the greatest weight of the blanks depending on the brand of the glass are given in Table 13.

Table 13

(1) Марки стекла	(2) Наивысшие категории по: (3) n_D, $n_F - n_C$ при размере заготовки в мм: (4) до 150	(5) св. 150	(6) оптической однородности при размере заготовки в мм: (4) до 150	(5) св. 150	(7) двойному лучепреломлению	(8) светопоглощению	(9) бессвильности при размере заготовки в мм: (10) до 150	(11) св. 150 до 300	(12) св. 300	(13) Классы по: (14) однородности партии	(15) бессвильности	(16) пузырности	(17) Наибольший вес заготовки в кг
ЛК1	3	4	1	1к	2	1	2	3к, 2	—	А—В	В	Б—Г	15
ЛК3	1	3	1	1к	2	0	1	3к, 2	—	А—В	В	Б—Г	30
ЛК4	1	2	1	1к	1	0	1	5к, 2	5к	А—В	В	А—В	*
ЛК5	0	2	2	1к	1	3	2	5к	5к	А—В	В	Г—Д	*
ЛК105	2	3	2	1к	1	4	2	5к	5к	А—В	В	Г—Д	*
ЛК6	0	3	1	1к	1	0	1	3к, 2	—	А—В	В	А—В	30
ЛК7	1	2	2	1к	1	2	2	4к, 2	5к	А—В	В	А—В	*
.ФК1	3	—	1	—	1	0	2	—	—	А—В	В	В—Д	1
.ФК13	3	—	1	—	1	1	2	—	—	А—В	В	Г—Д	1
ФК14	3	—	1	—	1	0	1	—	—	А—В	В	Г—Д	1
(К1)	1	3	1	1к	1	1	1	2к, 2	3к	А—В	Б, В	А—В	*

Key: (1) Brand of glass; (2) Highest category in respect to; (3) n_D, n_F--n_C with blank dimensions in mm; (4) up to 150; (5) above 150; (6) Optical uniformity with blank dimensions in mm; (7) Double refraction; (8) Light abosrptipn; (9) Stria-free state with blank dimensions in mm; (10) up to 150; (11) above 150 up to 300; (12) above 300; (13) Class in respect to; (14) Uniformity of batch; (15) Stria-free state; (16) Bubble condition; (17) Greatest weight of blank in kg.

Table 13 (continued)

(1) Марки стекла	(2) Наивысшие категории по: (3) n_D, $n_F - n_C$ при размере заготовки в мм: (4) до 150	(5) св. 150	оптической однородности при размере заготовки в мм (6): (4) до 150	(5) св. 150	(7) двойному лучепреломлению	(8) светопоглощению	(9) бессвильности при размере заготовки в мм: (10) до 150	(11) св. 150 до 300	(12) св. 300	(13) Классы по: (14) однородности партии	(15) бессвильности	(16) пузырности	(17) Наибольший вес заготовки в кг
К2	1	3	1	1к	1	1	1	2к, 2	3к	А—В	Б, В	А—В	*
(К102)	1	3	1	1к	1	2	1	2к, 2	3к	А—В	Б, В	Б—Г	*
(К3)	0	3	1	1к	1	1	1	1к, 1	2к	А—В	Б, В	А—Б	*
(К5)	1	3	1	1к	1	0	1	1к, 2	2к	А—В	Б, В	А—В	*
К8	0	2	1	1к	1	00	1	1к, 1	2к	А—В	Б, В	А—Б	*
К108	0	3	1	1к	1	0	1	1к, 1	2к	А—В	Б, В	А—В	*
К14	1	3	1	1к	1	1	1	2к, 2	3к	А—В	Б, В	Б—В	*
К114	1	3	1	1к	1	2	1	2к, 2	3к	А—В	Б, В	Б—В	*
К15	1	3	1	1к	1	0	1	2к, 2	3к	А—В	Б, В	Б—В	*
К17	1	3	1	1к	1	00	1	1к, 1	2к	А—В	Б, В	А—В	*
(К18)	1	3	1	1к	1	0	1	2к, 2	3к	А—В	Б, В	А—В	*
К19	0	3	1	1к	1	0	1	2к, 2	3к	А—В	Б, В	А—Б	*
К119	1	3	1	1к	1	1	1	2к, 2	3к	А—В	Б, В	А—В	*
К20	1	3	1	1к	1	0	1	2к, 2	3к	А—В	Б, В	А—В	*
БК4	0	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	А—В	*
БК104	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	Б—В	*
БК6	0	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	А—В	*
БК106	1	3	1	1к	1	1	1	3к, 2	4к	А—В	Б, В	Б—В	*
БК8	0	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	Б—В	*
БК108	1	3	1	1к	1	1	1	3к, 2	4к	А—В	Б, В	Б—Г	*
(БК9)	1	3	1	1к	1	1	1	3к, 2	4к	А—В	Б, В	Б—Г	*
БК10	0	3	1	1к	1	00	1	3к, 2	4к	А—В	Б, В	А—В	*
БК110	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	Б—В	*
(БК11)	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	Б—Г	*
БК12	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	В—Г	*
БК13	1	3	1	1к	1	2	1	3к, 2	4к	А—В	Б, В	Б—Г	*
(ТК1)	1	3	1	1к	1	1	1	3к, 2	4к	А—В	Б, В	Б—В	*

Table 13 (continued)

(1) Марки стекла	(2) Наивысшие категории по									(13) Классы по			(17)
	(3) n_D, $n_F - n_C$ при размере заготовки в мм		оптической однородности при размере заготовки в мм (6)		(7) двойному лучепреломлению	(8) светопоглощению	(9) бессвильности при размере заготовки в мм			(14) однородности партии	(15) бессвильности	(16) пузырности	Наибольший вес заготовки в кг
	(4) до 150	(5) св. 150	(4) до 150	(5) св. 150			(10) до 150	(11) св. 150 до 300	(12) св. 300				
(ТК101)	1	3	1	1к	1	2	1	3к, 2	4к	А—В	Б, В	В—Г	*
ТК2	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	В—Г	*
ТК102	1	3	1	1к	1	1	1	3к, 2	4к	А—В	Б, В	Г—Д	*
ТК4	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	В—Д	*
ТК104	1	3	1	1к	1	1	1	3к, 2	4к	А—В	Б, В	В—Д	*
ТК8	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	Г—Д	*
ТК108	1	3	1	1к	1	1	1	3к, 2	4к	А—В	Б, В	Г—Д	*
(ТК9)	1	3	1	1к	1	1	1	3к, 2	4к	А—В	Б, В	Д—Е	*
(ТК109)	1	3	1	1к	1	1	1	3к, 2	4к	А—В	Б, В	Д—Е	*
ТК12	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	В—Г	*
ТК112	1	3	1	1к	1	1	1	3к, 2	4к	А—В	Б, В	Г—Д	*
ТК13	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	Б—Г	*
ТК14	0	3	1	1к	1	1	1	3к, 2	—	А—В	В	А—В	15
						0	1	3к, 2	4к	А—В	Б, В	Д—Е	*
ТК114	1	3	1	1к	1	2	1	3к, 2	4к	А—В	Б, В	Д—Е	*
ТК16	0	3	1	1к	1	1	1	3к, 2	—	А—В	В	А—В	15
						0	1	3к, 2	4к	А—В	Б, В	Г—Д	*
ТК116	1	3	1	1к	1	1	1	3к, 2	4к	А—В	Б, В	Г—Д	*
ТК17	3	—	1	—	1	0	1	—	—	А—В	В	Г—Д	1
ТК20	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	Г—Д	*
ТК120	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	Г—Д	*
ТК21	0	3	1	1к	1	1	1	3к, 2	—	А—В	В	А—В	15
						0	1	3к, 2	4к	А—В	Б, В	Г—Д	*
ТК121	1	3	1	1к	1	1	1	3к, 2	4к	А—В	Б, В	Д—Е	*
ТК23	1	3	1	1к	1	1	1	3к, 2	4к	А—В	Б, В	Г—Д	*
ТК123	1	3	1	1к	1	2	1	2к, 2	4к	А—В	Б, В	В—Г	*
.СТК3	1	3	1	2к	1	1	1	3к, 2	4к	А—В	В	В—Д	*

Table 13 (continued)

(1) Марки стекла	(2) Наивысшие категории по									(13) Классы по			Наибольший вес заготовки в кг (17)
	(3) n_D, $n_F - n_C$ при размере заготовки в мм		оптической однородности при размере заготовки в мм (6)		(7) двойному лучепреломлению	(8) светопоглощению	бессвильности при размере заготовки в мм (9)			(14) однородности партии	(15) бессвильности	(16) пузырности	
	(4) до 150	(5) св. 150	(4) до 150	(5) св. 150			(10) до 150	(11) св. 150 до 300	(12) св. 300				
СТК7	1	3	2	2к	1	3	2	3к, 2	4к	А—В	В	В—Г	30
СТК8	2	—	2	—	1	3	2	—	—	А—В	В	В—Г	10
СТК9	1	—	2	—	1	4**	2	—	—	А—В	В	Г—Д	0,3
СТК10	3	—	2	—	1	4	2	—	—	А—В	В	Д—Е	5
(СТК12)	2	—	2	—	1	3	2	—	—	А—В	В	В—Д	5
(КФ1)	1	—	1	—	1	2	1	—	—	А—В	В	Г—Д	1
КФ4	0	3	1	1к	1	1	1	2к, 2	3к	А—В	Б, В	А—В	*
КФ104	1	3	1	1к	1	1	1	2к, 2	3к	А—В	Б, В	Б—Г	*
(КФ5)	1	—	1	—	3	0	1	—	—	А—В	Б, В	Б—В	1
КФ6	0	—	1	—	1	0	1	—	—	А—В	В	Б—Г	3
КФ106	1	—	1	—	1	1	1	—	—	А—В	В	В—Г	3
КФ7	3	—	1	—	2	3	2	—	—	А—В	В	Б—В	3
(КФ8)	1	—	1	—	1	1	1	—	—	А—В	Б, В	А—В	3
БФ1	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	В—Г	*
БФ4	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	А—В	*
БФ6	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	Б—В	*
БФ106	1	3	1	1к	1	1	1	3к, 2	4к	А—В	Б, В	Б—В	*
БФ7	1	3	1	1к	1	1	1	3к, 2	4к	А—В	Б, В	Б—В	*
БФ107	1	3	1	1к	1	1	1	3к, 2	4к	А—В	Б, В	В—Г	*
БФ8	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	А—Б	*
БФ108	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	Б—В	*
БФ11	1	3	1	1к	1	1	1	3к, 2	4к	А—В	Б, В	Г—Д	*
БФ111	1	3	1	1к	1	1	1	3к, 2	4к	А—В	Б, В	Г—Е	*
БФ12	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	А—В	*
БФ112	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	А—В	*
БФ13	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	Г—Д	*
БФ113	1	3	1	1к	1	1	1	3к, 2	4к	А—В	Б, В	Г—Д	*

Table 13 (continued)

(1) Марки стекла	(2) Наивысшие категории по: (3) n_D, $n_F - n_C$ при размере заготовки в мм: (4) до 150	(5) св. 150	(6) оптической однородности при размере заготовки в мм: (4) до 150	(5) св. 150	(7) двойному лучепреломлению	(8) светопоглощению	(9) бессвильности при размере заготовки в мм: (10) до 150	(11) св. 150 до 300	(12) св. 300	(13) Классы по: (14) однородности партии	(15) бессвильности	(16) пузырности	(17) Наибольший вес заготовки в кг
БФ16	0	3	1	1к	1	1	1	3к, 2	—	А—В	Б, В	А—Г	15
БФ18	1	3	1	1к	1	1	1	3к, 2	4к	А—В	Б, В	Б—В	*
БФ19	0	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	Г—Д	*
БФ21	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	А—В	*
(БФ23)	1	3	1	1к	1	1	1	3к, 2	4к	А—В	Б, В	А—В	*
БФ24	1	3	1	1к	1	00	1	3к, 2	4к	А—В	Б, В	А—Г	*
БФ25	1	3	1	1к	1	1	1	3к, 2	4к	А—В	Б, В	Г—Д	*
(БФ26)	1	3	1	1к	1	1	1	3к, 2	4к	А—В	Б, В	В—Г	*
БФ27	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	Б—Г	*
БФ28	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	Г—Д	*
.ТБФ3	3	—	1	—	1	4	2	—	—	А—В	В	В—Д	0,5
ТБФ4	3	—	1	—	1	4	2	—	—	А—В	В	В—Д	0,5
(ЛФ1)	1	3	1	1к	1	1	1	3к, 2	4к	А—В	В	А—Б	10
ЛФ5	0	2	1	1к	1	0	1	2к, 2	3к	А—В	Б, В	А—Б	*
ЛФ105	1	3	1	1к	1	0	1	3к, 2	3к	А—В	Б, В	А—Б	*
(ЛФ7)	0	3	1	1к	1	0	1	2к, 2	3к	А—В	Б, В	А—Б	*
ЛФ8	3	—	1	—	2	4	1	—	—	А—В	Б, В	Б—В	1
ЛФ9	3	—	1	—	2	3	1	—	—	А—В	Б, В	Б—В	1
ЛФ10	1	—	2	—	3	2	1	—	—	А—В	Б, В	А—В	1
ЛФ11	1	3	1	1к	1	0	1	2к, 2	3к	А—В	Б, В	А—В	*
ЛФ111	1	3	1	1к	1	0	1	3к, 2	3к	А—В	Б, В	Б—В	*
ЛФ12	3	—	1	—	2	3	1	—	—	А—В	Б, В	В—Г	1
Ф1	0	2	1	1к	1	00	1	1к, 1	2к	А—В	Б, В	А—Б	*
Ф101	1	3	1	1к	1	0	1	1к, 1	2к	А—В	Б, В	А—В	*
(Ф2)	1	2	1	1к	1	00	1	2к, 2	3к	А—В	Б, В	А—Б	*
(Ф102)	1	3	1	1к	1	0	1	2к, 2	3к	А—В	Б, В	А—Б	*
Ф4	0	2	1	1к	1	0	1	2к, 2	3к	А—В	Б, В	А—Б	*

Table 13 (continued)

(1) Марки стекла	(2) Наивысшие категории по									(13) Классы по			Наибольший вес заготовки в кг (17)
	(3) $n_D \cdot n_F - n_C$ при размере заготовки в мм		оптической однородности при размере заготовки в мм (6)		(7) двойному лучепреломлению	(8) светопоглощению	(9) бессвильности при размере заготовки в мм			(14) однородности партии	(15) бессвильности	(16) пузырности	
	(4) до 150	(5) св. 150	(4) до 150	(5) св. 150			(10) до 150	(11) св. 150 до 300	(12) св. 300				
Ф104	1	3	1	1к	1	0	1	2к, 2	3к	А—В	Б, В	А—Б	*
Ф6	0	2	1	1к	1	0	1	2к, 2	3к	А—В	Б, В	А—Г	*
(Ф7)	1	3	1	1к	1	0	1	2к, 2	3к	А—В	Б, В	Б—В	*
Ф8	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	А—Б	*
Ф108	1	3	1	1к	1	1	1	3к, 2	4к	А—В	Б, В	А—Б	*
Ф9	3	—	1	—	2	4	1	—	—	А—В	В	Б—В	1
Ф13	0	2	1	1к	1	0	1	2к, 2	3к	А—В	Б, В	А—Б	*
Ф113	1	3	1	1к	1	0	1	2к, 2	3к	А—В	Б, В	А—В	*
ТФ1	0	3	1	1к	1	00	1	3к, 2	4к	А—В	Б, В	А—Б	*
ТФ101	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	А—В	*
ТФ2	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	А—Б	*
ТФ102	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	А—Б	*
ТФ3	0	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	Б—Г	*
ТФ4	0	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	Б—Г	*
ТФ5	0	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	Б—Г	*
ТФ105	2	3	1	1к	1	4*	1	3к, 2	4к	А—В	Б, В	В—Д	*
ТФ7	0	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	Б—В	*
ТФ8	1	3	1	1к	1	0	1	3к, 2	4к	А—В	Б, В	А—В	*
ТФ108	2	3	1	1к	1	2	1	3к, 2	4к	А—В	Б, В	В—Г	*
ТФ10	2	3	1	1к	1	1	1	3к, 2	—	А—В	В	Д—Е	15
ТФ11	3	—	1	—	2	4	1	—	—	А—В	В	Г—Д	1
ТФ12	3	—	1	—	1	4	1	—	—	А—В	Б, В	Д—Е	1
ОФ1	1	3	1	1к	1	0	1	3к, 2	4к	А—В	В	А—В	*
ОФ101	1	3	1	1к	1	1	1	3к, 2	4к	А—В	В	Б—В	*
(ОФ2)	3	—	1	—	1	0	1	—	—	А—В	В	В—Г	1
.ОФ3	1	—	1	—	1	3	2	—	—	А—В	В	В—Г	1
.ОФ4	1	—	1	—	1	0	2	—	—	А—В	В	В—Д	1
.ОФ5	1	—	1	—	1	00	2	—	—	А—В	В	Г—Д	1

Notes:

1. One asterisk means that the greatest weight of a blank is determined by its dimensions within the limits established by the present standard.

2. Two asterisks mean that the coefficient of light absorption should not exceed 2.2% per 1 cm.

3. Lines indicate that glass of the corresponding brand in blanks of the given dimensions is not produced without a preliminary agreement.

4. In glasses of brands noted with a raised dot · in the determination of the class of bubble condition bubbles (crystals, inclusions) with dimensions up to 0.03 mm inclusive are not taken into consideration.

The highest categories of bubble condition of blanks depending on their weight and the class of bubble [bleb] condition of the glass are given in Table 14.

Table 14

(2) Класс пузырности стекла	(1) Наивысшие категории пузырности									
	1; 1а	2	3	4	5	6	7	8	9	10
	(3) Вес заготовки в г, не более									
А(А)	100	250	500	700	1000	2000	3000	20000	(4) Св. 20000	(4) Св. 20000
Б(В)	50	50	100	200	300	500	1000	3000	20000	Св. 20000
В(V)	30	30	50	100	300	500	1000	3000	20000	Св. 20000
Г(G)	10	10	30	50	300	500	1000	3000	20000	Св. 20000
(D)Д, Е(Е)	—	5	10	30	100	300	1000	3000	20000	Св. 20000

Key: (1) Highest categories of bubble condition; (2) Class of bubble condition of the glass; (3) Weight of blank in g, no more than; (4) Higher than.

(CHANGED WORDING - "Information directory of standards" No 3, 1969).

2.3. In respect to the stability to the influence of ionizing

radiation, characterized by an increase of optical density ΔD per 1 cm after irradiation with a dose of gamma-radiation of 10^5 R, the optical glass of series 100 should correspond to the requirements of Table 15.

Table 15

(1) Марка стекла	(2) ΔD, не более	(1) Марка стекла	(2) ΔD, не более	(1) Марка стекла	(2) ΔD, не более
ЛК105	0,050	ТК109	0,020	БФ113	0,200
К102	0,035	ТК112	0,025	ЛФ105	0,110
К108	0,015	ТК114	0,025	ЛФ111	0,080
К114	0,045	ТК116	0,025	Ф101	0,070
К119	0,025	ТК120	0,020	Ф102	0,070
БК104	0,015	ТК121	0,065	Ф104	0,070
БК106	0,015	ТК123	0,025	Ф108	0,070
БК108	0,020	КФ104	0,060	Ф113	0,070
БК110	0,040	КФ106	0,070	ТФ101	0,080
ТК101	0,025	БФ106	0,090	ТФ102	0,080
ТК102	0,025	БФ107	0,070	ТФ105	0,040
ТК104	0,025	БФ108	0,040	ТФ108	0,080
ТК108	0,025	БФ111	0,060	ОФ101	0,050
		БФ112	0,045		

Key: (1) Brand of glass; (2) ΔD, no more than.

2.4. Optical glass should be produced in batches in blanks according to the designs of the purchaser, approved in the established order or in plates of dimensions indicated in the order according to GOST 13240-67.

2.5. Each batch of optical glass must be accepted by the technical control of the enterprise-producer. The producer should guarantee the conformity of the glass produced to the conditions of the order and the requirements of the present standard.

3. Test Methods

3.1. For a control check by the consumer of conformity of production to the requirements of the present standard and the conditions of the order the rules for sampling and test methods indicated in points 3.3-3.13 of the present standard should be used.

3.2. The control check of optical glass should be made in accordance with the certificate data of the enterprise producer which accompanies each batch.

In the certificate it should be indicated:

the measured values of refractive indices and average dispersion of the glass; categories and classes based on the indices of quality according to the requirements of point 1.4 (specified by the order and actual); numbers of cookings of glass from which the batch is made up.

If during the check the consumer detects nonconformity of the batch of glass to the requirements of the present standard and the conditions of the order, the entire batch is subject to return to the producer.

3.3. Measurement of the refractive index of glass of the 0 and 1st categories should be made according to GOST 5723-51 on a goniometer with a maximum error of no more than $\pm 1.5 \cdot 10^{-5}$, and the remaining categories - according to GOST 5421-56 by the Obreimov method or with a superposed refractometer with a maximum error of no more than $\pm 1 \cdot 10^{-4}$.

For determination of category according to refractive index no less than two samples or blanks from each cooking included in the batch are selected. The control samples or blanks are annealed together with the batch of glass.

3.4. Measurement of the average dispersion of glass of the 0 and 1st categories should be made according to GOST 5723-51 on a goniometer with a maximum error of no more than $\pm 1.5 \cdot 10^{-5}$, and the remaining categories - according to GOST 3516-56 on a refractometer with a maximum error of no more than $\pm 2 \cdot 10^{-5}$.

For determination of category based on average dispersion from each cooking included in the batch one sample of glass is selected. Samples of glasses with average dispersion which changes during annealing (KF7, TBF3, TBF4, LF8, LF9, LF10, LF12, F9, TF10, TF11, TF12) should be annealed together with the batch of blanks.

3.5. Conformity of the uniformity of a batch of blanks based on refractive index to classes A and B should be determined according to GOST 8201-56 by the compensation method by means of measuring the difference of the refractive indices with a maximum error of no more than $\pm 1 \cdot 10^{-5}$.

For determination of the class of uniformity of a batch based on refractive index no less than four samples of unannealed glass are selected. These are annealed together with the batch of blanks. The samples should be prepared from adjacent sections of one chunk of glass of the same brand as the blank.

Conformity of the uniformity of a batch of blanks in respect to refractive index to class B should te established on the basis of the results of measurement according to point 3.3 of the present standard.

3.6. Conformity of the uniformity of a batch of blanks in respect to average dispersion to classes A and B should be guaranteed by the fact that the batch is made up entirely of glass from one cooking.

Conformity of the uniformity of a batch of blanks in respect to average dispersion to class B should be established on the basis of results of measurements according to point 3.4.

3.7. Determination of optical uniformity should be done:

a) according to GOST 3518-56* on a collimator installation - for glasses of categories 1-5 (p. 1.7.1);

b) according to technical documentation, approved in the established order, on a polarimeter for control of large blanks for glass of categories 1K-5K (p. 1.7.2).

3.7.1. In the determination of the optical uniformity of glass in respect to categories 1-5 the following are subject to direct control: blanks if they have the form of disks or plates, or special control samples if the blanks have the form of lenses and prisms. Control of blanks in the form of disks and plates is done by random sampling. Blanks for random control should be selected from different points of the furnace in which the batch of glass is annealed. The number of blanks subject to random control is indicated in Table 16.

The batch is considered suitable if all the blanks inspected conform to the required category of optical uniformity.

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* GOST 3518-69 has been in effect since 1 July 1970.

Table 16

(1) Размер заготовки (диаметр или сторона) в мм	(2) Число просматриваемых заготовок при приемке стекла по категориям оптической однородности	
	1–3	4
(3) Св. 60 до 100	(4) 5% от партии, но не менее 5 шт.	(5) Не контролируется
. 100 . 150	(4) 5% от партии, но не менее 5 шт.	(6) 5% от партии, но не менее 3 шт.

Key: (1) Dimension of blank (diameter or side) in mm; (2) Number of inspected blanks during acceptance of glass based on categories of optical uniformity; (3) Higher than _____ up to ____; (4) 5% from a batch, but no less than 5 pieces; (5) Not controlled; (6) 5% from a batch, but no less than 3 pieces.

The required category of glass in blanks of all dimensions, subject to testing for the 5th category, and in blanks with dimensions less than those indicated in Table 16, which are subject to testing for categories 1-4, should be ensured by the selection of the appropriate conditions of annealing and control of its carrying out.

The control samples, subjected to testing in place of blanks of lenses and prisms, are annealed together with the batch of glass. The number of control samples for each annealing is established in Table 17.

Table 17

(1) Размер заготовки (диаметр, высота или сторона) в мм	(2) Наименьшее число контрольных образцов при приемке стекла по категориям оптической однородности			(3) Примечание
	1–2	3	4	
(4) Св. 40 до 60	1	1	1	(5) При приемке заготовок призм
Св. 60 до 80	2	1	1	(6) При приемке заготовок линз и призм
. 80 . 100	3	2	1	
. 100 . 120	3	3	3	
. 120 . 150	5	5	5	

Key: (1) Dimensions of blanks (diameter, height or side) in mm; (2) Least number of control samples when accepting glass based on categories of optical uniformity; (3) Note; (4) Higher than __ up to __; (5) During acceptance of blanks of prisms; (6) During acceptance of blanks of lenses and prisms.

It is permitted to reduce the number of control samples if in this case the conformity of the glass to the requirements of the order is guaranteed.

The batch is considered suitable, if all the control samples after annealing together with the batch of blanks conform to the required category in respect to optical uniformity.

The required category of glass in blanks of prisms and lenses of all dimensions, subject to testing for the 5th category, or in blanks of prisms with dimensions less than 40 mm and in blanks of lenses with dimensions less than 60 mm, subject to testing for categories 1-4, should be ensured by the selection of the corresponding conditions of annealing and control of its carrying out.

3.7.2. In the determination of optical uniformity of glass for categories 1K-5K every blank is subject to control.

3.8. Determination of double refraction of blanks of glass of categories 1-5 should be done according to GOST 3519-56* on a polarimeter with an error of measurement of path difference not exceeding that indicated in Table 18.

Table 18

(1) Измеряемая разность хода в *мм*	(2) Погрешность результатов измерения в *мм*, не более
(3) До 100	±3
(4) Св. 100 до 200	±5
" 200 " 400	±7
" 400 " 600	±9
" 600 " 1000	±12

Key: (1) Measured difference of path in nm; (2) Error of results of measurement in nm, no more than; (3) Up to; (4) Higher than ___ up to ___.

During testing of blanks with dimensions up to 100 mm inclusive 5% of the blanks from the batch, but no less than 5 pieces, are subject to control,and with dimensions greater than 100 mm - every blank of the batch.

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* GOST 3519-69 has been in effect since 1 July 1970.

If due to the small dimensions or complex form of the blanks the path difference in them cannot be measured directly, then special control samples in accordance with GOST 3519-56* are subject to control. These in quantities of five are annealed together with the batch of blanks. The samples are laid in a site in the annealing furnace with the greatest deviations from average temperature.

The batch is considered suitable, if all the blanks which have passed random control or all the control samples after annealing conform to the required category in respect to double refraction.

Conformity of blanks of glass of category 1a should be guaranteed due to the fact that they are produced by means of mechanical forming of pot, block or sheet glass without the application of pressing and subsequent annealing, if the glass is acknowledged for categories 4 and 5 of optical uniformity, or by means of sawing out from the middle part of larger blanks which had undergone fine annealing, if the glass is acknowledged for categories 1-3 of optical uniformity.

A qualitative evaluation of blanks for category 1a of double refraction should be made with the help of a polariscope.

3.9. Determination of the coefficient of light absorption should be made according to GOST 3520-51 with the help of a photometer, ensuring the measurement of the coefficient of transmission with a maximum error of no more than ± 0.005.

For measurement one sample each of glass is selected from each cooking included in the batch. For glass of 000 and 00 categories the length of the samples should be 180-200 mm, for the remaining categories - 100-110 mm.

3.10. In the testing of glass for categories 1 and 2 the determination of striation (point 1.10.1) should be done according to GOST 3521-57** The required category of striation should be ensured by means of interoperation control of the glass or control of the blanks.

The evaluation of striation [stria-free state] for categories 1K-4K (point 1.10.2) should be made on a projection installation with

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** GOST 3521-60 has been in effect since 1 July 1970.

a point source of light. Main parameters of the installation:

distance from the blank up to the screen on which the shadow picture of the striae is projected - 2.5 mm;

distance from the source of light to the screen - 8 mm.

Source of light - mercury-quartz lamp of the DRSh-250 type with two interchangeable diaphragms: one with an opening with a diameter of 0.2 mm, the second with an opening with a diameter of 2 mm.

During testing of blanks for category 1K a diaphragm with an opening of 0.2 mm is used, and the shadow picture of striae which is subject to investigation is photographed on the screen. During the testing for the remaining categories a diaphragm with an opening of 2 mm is used, and the shadow picture of the striae is investigated on the screen visually.

The evaluation of striation condition for category 5K is done by means of the external examination of the blanks. The double refraction in the very coarse striae which are detected visually is measured with a polarimeter. During measurement the blank is mounted so that the investigated stria is found in a vertical or horizontal position, or the polarimeter itself is set up in such a way that the direction of the oscillations transmitted by it comprises an angle of 45° with the direction of the stria in the blank.

Every blank is subject to control in respect to categories 1K--5K.

3.11. Determination of the bubble state [seedy state] should be done in accordance with GOST 3522-57.

The required category of seediness should be ensured by interoperation control of the glass or control of the blanks, in which case each blank is subject to testing.

For determining the class of seediness a sample of glass is selected in the established order from each cooking which is included in the batch. It is permitted to determine the class of seediness directly in the blank, if its volume exceeds 8 dm^3. In these cases the number of bubbles is counted in glass with a volume of no less than 6 dm^3.

3.12. Determination of the resistance of glasses of series 100 to the influence of penetrating radiation is done on an installation with a source of Co^{60} radiation with a dose power of 1400 R/h. An increase of optical density of a sample of glass after irradiation with a dose of 10^5 R of gamma-radiation is measured in accordance with GOST 3520-51 with a photometer, providing for the measurement of the transmission coefficient with a maximum error not exceeding ± 0.01 ($\pm 1\%$). The measurements should be made no later than 2 ± 0.5 h after irradiation. During this time the samples should be stored in the dark.

During plant testing it is permitted to determine the arrangements in accordance with the requirements of the technical documentation approved in the established order.

Three samples of glass each are selected for testing from each cooking included in the batch. One of the samples is subjected to testing, and the other two are stored for the case of control or arbitration tests.

(CHANGED WORDING - "Information directory of standards" No 3, 1969).

3.13. Samples with an indication of the brand of the glass and the number of the cooking which are selected for measurement of refractive index, average dispersion and resistance to ionizing radiation should be stored at the enterprise-producer for no less than three years from the day of cooking, and samples selected for measurement of light absorption - no less than one year.

APPENDIX

1. Recommendations for the selection of categories based on optical uniformity, double refraction and striation depending on the diameter of the optical parts, their purpose and type of instruments in which they are used.

Table 1

(1) Виды деталей	(2) Наименование элементов оптических систем	(3) Рекомендуемые категории при диаметре деталей в мм						
		(4) Оптическая однородность		(7) Двойное лучепреломление		(10) Бессвильность		
		(5) до 150 вкл.	(6) св. 150	(8) до 150 вкл.	(9) св. 150	(11) до 150 вкл.	(12) св. 150 до 300 вкл.	(13) св. 300
(14) Сферическая оптика	(15) Объективы:							
	(16) микроскопов	1	—	1	—	1	—	—
	(17) телескопических систем большого увеличения	2	2к	2	2	1	1; 3к—4к	3к—4к
	(18) телескопических систем малого увеличения	3	2к—3к	2—3	2	1	1; 3к—4к	—
	(19) аэросъемочные	3	1к—2к	2	2	1	2к—3к	2к—3к
	(20) фотографические	3	3к—4к	2	2	1	2; 3к—4к	—
	(21) киносъемочные и проекционные	3	3к	2	2	1	1; 3к—4к	—
	(22) для коллиматоров	1	1к	1	2	1	2к	2к
	(23) для теневых приборов	—	2к	—	2	—	1к—2к	1к—2к
	(24) для телевизионных приборов	3	3к	2	2	1	1; 3к—4к	—
	(25) для ультрафиолетовой и инфракрасной областей	3	2к—3к	2	2	1	1; 3к—4к	3к—4к
	(26) астрономические	—	1к—2к	—	2	—	2к—3к	2к—3к
	(27) Оборачивающие системы	3	2к—3к	2—3	2	1	1; 3к—4к	3к—4к
	(28) Коллективы	3	3к—4к	2—3	2—4	1	2; 4к	—
	(29) Окуляры и лупы	3—5	—	3	—	2	—	—
	(30) Конденсоры	4	3к—4к	3	2—4	2	2; 4к	—
	(31) Детали поляризационных приборов	1—4	—	1а	—	1—2	—	—

Continuation

(1) Виды деталей	(2) Наименование элементов оптических систем	(3) Рекомендуемые категории при диаметре деталей в мм						
		(4) Оптическая однородность		(7) Двойное лучепреломление		(10) Бессвильность		
		(5) до 150 вкл.	(6) св. 150	(8) до 150 вкл.	(9) св. 150	(11) до 150 вкл.	(12) св. 150 до 300 вкл.	(13) св. 300
(32) Плоская оптика	Призмы спектральные и рефрактометрические (33)	1	—	1	—	1	—	—
	Призмы отражательные (34)	1–3	2к	2	2	1–2	2к–3к	—
	Пластины интерферометров (35)	1–3	1к	1–3	2	1	2к	2к
	Компенсаторы (36)	1–3	1к–2к	1–3	2	1	1; 2к–3к	—
	Сетки, шкалы, лимбы (37)	3–5	3к–4к	3–5	2–4	1	1; 3к–4к	3к–4к
	Смотровые стекла (38)	3–5	3к–5к	3–5	2–3	1	2; 4к–5к	4к–5к
(39) Зеркала	Полупрозрачные (40)	1–3	1к–2к	1–3	2	1	2к	2к
	С внутренним отражением (41)	1–3	1к–2к	1–3	2	1	1к–2к	2к
	С внешним отражением: (42)							
	без отверстия (43)	Не нормируется (46)	4к–5к	3–5	3–5	Не нормируется (46)	5к	5к
	с центральным или разгрузочными отверстиями (44)	Не нормируется	4к–5к	3–4	3–4	Не нормируется	5к	5к
	внеосевые (45)	Не нормируется	2к–3к	1–2	1	Не нормируется	5к	5к

Key: (1) Types of parts; (2) Name of elements of optical systems; (3) Recommended categories with diameter of parts in mm; (4) Optical uniformity; (5) up to 150 inclusive; (6) above 150; (7) Double refraction; (8) up to 150 inclusive; (9) above 150; (10) Striation; (11) up to 150 inclusive; (12) above 150 up to 300 inclusive; (13) above 300; (14) Spherical optics; (15) Objectives:; (16) microscopes; (17) high magnification telescope systems; (18) medium magnification telescope systems; (19) aerial photography; (20) photographic; (21) motion picture filming and projection; (22) for collimators; (23) for schlieren devices; (24) for television devices; (25) for ultraviolet and infrared ranges; (26) astronomical; (27) Turning systems; (28) Field lenses; (29) Eyepieces and magnifying glasses; (30) Condensing lenses; (31) Parts for polarization devices; (32) Plane optics; (33) Prisms, spectral and refractometric;

Key (continued):
(34) Prisms, reflecting; (35) Interferometer plates; (36) Compensators; (37) Gratings, dials, graduated circles; (38) Sight glasses; (39) Mirrors; (40) Transluscent; (41) With internal reflection; (42) With external reflection; (43) without an aperture; (44) with central or relief apertures; (45) extra-axial; (46) Not standardized.

For prisms and noncircular plates by diameter of a part is meant the greatest dimension of the light beam passing through them, for scales - their length.

2. Reference table of values of stress optical coefficient of glass. [Table 2]

Stress optical coefficient - index of relative optical sensitivity of glass to mechanical stresses, determined by the expression

$$\delta = B(\sigma_1 - \sigma_2)l,$$

where:

δ - optical difference of path in μm, developing during passage of polarized light through a stressed sample:

l - thickness of sample in cm;

σ_1 and σ_2 - main normal stresses in kg/cm^2;

B - stress optical coefficient in Brewsters (dimensionality of coefficient B - μm·cm/kg).

Table 2

(1) Марки стекла	(2) Коэффициент B в брюстерах при λ=550 нм
ФК 14	(3) До 2,0 вкл.
ТК-8; 13; 14; 16; 17; 20; 21; 108; 114; 116; 120; 121	
СТК-3; 7; 8; 9; 12	
БФ16	
ТФ-3; 4; 5; 7; 10; 12; 105	
ЛК3	(4) Св. 2,0 до 2,8 вкл.
ФК-1; 13	
К-3; 5; 8; 17; 108	
БК-4; 6; 8; 11; 12; 13; 104; 106; 108	
ТК-1; 2; 4; 9; 12; 23; 101; 102; 104; 109; 112; 123	
СТК10	
БФ-1; 4; 11; 12; 13; 19; 24; 25; 26; 27; 28; 111; 112; 113	
ТБФ-3; 4	
Ф-7; 8; 13; 108; 113	
ТФ-1; 2; 8; 11; 101; 102; 108	
ОФ-4; 5	
ЛК-1; 4; 5; 6; 7; 105	(5) Св. 2,8
К-1; 2; 14; 15; 18; 19; 20; 102; 114; 119	
БК-9; 10; 110	
КФ-1; 4; 5; 6; 7; 8; 104; 106	
БФ-6; 7; 8; 18; 21; 23; 106; 107; 108	
ЛФ-1; 5; 7; 8; 9; 10; 11; 12; 105; 111	
Ф-1; 2; 4; 6; 9; 101; 102; 104	
ОФ-1; 2; 3; 101	

Key: (1) Brand of glass; (2) Coefficient B in Brewsters with λ=550 nm; (3) Up to 2.0 inclusive; (4) Above 2.0 up to 2.8 inclusive; (5) Above 2.8.

(CHANGED WORDING - "Information directory of standards" No 3, 1969).

3. Reference table [Table 3] for conversion from category of optical uniformity according to Table 5 of this standard to categories according to Table 6 for blanks made of glass which had undergone fine annealing with a stress optical coefficient within the limits from 2.0 to 2.8 Brewsters inclusive.

Table 3

(1) Категория оптической однородности		(4) Волновая аберрация в длинах волн				(7) Краевое двойное лучепреломление	
		(5) от плоской поверхности		(6) от сферической поверхности			
(2) по табл. 5	(3) по табл. 6	$K_п$	$\Delta K_п$	$K_с$	$\Delta K_с$	(8) Наибольшая разность хода $\delta_{макс}$ в мм на всю толщину заготовки	(9) Неравномерность распределения разности хода $\delta_{макс} - \delta_{мин}$, не более
1	1к	до 0,25	до 0,25	до 0,1	до 0,1	60±20	30
2	2к	0,25—0,7	0,25—0,5	0,1—0,35	0,1—0,25	120±30	50
3	3	0,7—1,5	0,5—1,0	0,35—0,75	0,25—0,5	200±50	80
4	4к	1,5—3,0	1,0—1,5	0,75—1,5	0,5—0,75	400±100	120
5	5к	св. 3 *	св. 1,5	св. 1,5	св. 0,75	св. 600	150

*- higher than.

Key: (1) Category of optical uniformity; (2) according to Table 5; (3) according to Table 6; (4) Wave aberration in wavelengths; (5) from a plane surface; (6) from a spherical surface; (7) Edge double refraction; (8) Greatest difference of path $\delta_{макс}$ in nm for the entire thickness of the blank; (9) Nonuniformity of distribution of path difference $\delta_{макс} - \delta_{мин}$, no more than.

$K_п$ and $K_с$ - wave aberration, determining the overall deviation of a wave emerging from a blank from a plane or the nearest sphere.

$\Delta k_п$ and $\Delta K_с$ - variables, characterizing the astigmatism of the plane or spherical front of a wave.

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